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At the Pan-Pacific Research Institution

The Pan-Pacific Research Institution, an outgrowth of the First Pan-Pacific Food Conservation Conference, is developing into an organization of actual and active research workers interested in the economic problems of food, transportation, and population throughout the Pacific area.

For the local work and service in Honolulu, spacious grounds and buildings have been set aside by the Pan-Pacific Union (through the generosity of the Castle family). These buildings in Manoa Valley can conveniently house some forty visiting scientists, and it is proposed that research workers from every part of the Pacific will be invited to make their home here while pursuing research work in Hawaii.

The Union has entertained at the Institution a number of distinguished scientists from Australia, New Zealand, Canada, the United States, China, Korea, and Japan. Small Pan-Pacific conferences of leading men in many lines of thought and action it is hoped will gather at the Institution in Honolulu as guests of the Union. Here they may live, work, and plan together. Here the First Pan-Pacific Fisheries Conference was held with Dr. David Starr Jordan as chairman and resident at the Institution for some months, in close conference with ichthyologists from every part of the Pacific. Out of this conference has grown a work undertaken by the Institution of publishing in its Journal check lists of the fish of every Pacific country, these to be bound together finally in a single volume containing a check list of the fish of the Pacific.

Councils of the Pan-Pacific Research Institution are at work on check lists in the several Pacific lands and islands of the indigenous trees and plants as well as of their natural enemies and the parasites that destroy these injurious insects, these check lists to be published from time to time in the Journal of the Institution.

The cooperation of scientists engaged in research work in any part of the Pacific is solicited, and a cordial invitation is extended to those attacking the problems of food production and distribution to visit the Institution buildings in Honolulu as guests.

It is hoped that cooperating councils of the Institution may be established in each and every Pacific land. Those already appointed in Hawaii are:

Aquatic Resources Council, Dr. David Starr Jordan, chairman.

Plant Constituent Council, Dr. Nils P. Larsen, chairman.

Crop Development Council, Prof. F. G. Krauss, chairman.

Race and Population Study Council, Kilmer O. Moe, chairman.

Health and Sanitation Council, Dr. C. B. Cooper, chairman.

Pan-Pacific Botanic Garden Council, Willis T. Pope, chairman.

Animal Husbandry Council, Prof. L. A. Henke, chairman.

Meteorological and Topographical Council, E. A. Beals, chairman.

Legislative Council, Col. F. M. Brown, chairman.

Entomological Council, Prof. J. F. Illingworth, chairman.

A limited number of students are accepted at the Institution, a building on the grounds being set aside for their occupancy, the Union financing their tuition, they giving certain hours as helpers at the Institution.

The first number of the Journal contained a "Check-list of the Fish of Hawaii" by Dr. David Starr Jordan and Dr. Barton Warren Evermann; the second, a list of the "Institutes for Research Work in the Interest of Agriculture in the Netherlands Indies," by Dr. P. J. S. Cramer; the third number a list of "Institutions for Research Work in the Territory of Hawaii." A recent number contained a "Check-List of the Fish of Fiji," by Gilbert P. Whitley of the Australian Museum, Sydney, and a similar list of the fish of New Zealand prepared by W. J. Phillipps, F. L. S., Dominion Museum, Wellington.

A Bibliography of the Literature Dealing with the Algal Food of Marine Animals

By Dr. JOSEPHINE E. TILDEN, University of Minnesota

Marine algae form the fundamental food supply of all marine animals. From this point of view they may be divided into three classes:

1. **Plankton,** microscopic unicellular floating forms.
2. **Attached plants,** the larger fixed plants found growing on the continental shelf.
3. **Detritus,** the dying or dead remains of plants belonging to the other two groups, making up the mass of general organic débris on the sea bottom.

Formerly the plankton algae, especially diatoms, were accorded almost the entire credit for constituting the "pastures of the sea." A minority, at least, of present-day investigators consider that the attached plants and the detritus mass form a much more important source of organic material used as food by animals.

Seaweeds grow abundantly in the proper environment, wherever there is a suitable substratum for attachment, adequate illumination, and a constant supply of inorganic food materials. Such conditions are found in the shallow waters of the continental shelf.

The importance of light for the photosynthesis of these chlorophyll-bearing plants is undoubted. Cloudiness and turbidity of the water caused by silt carried down by streams in flood, are the main factors interfering with the penetration of light.

Algae absorb nourishment from the sea-water which bathes their surfaces. But the water must contain all the necessary foodstuffs—nitrogen compounds, carbonic acid, phosphoric acid, silica, calcium and oxygen—for if any are lacking the plants cease to grow. These necessary food constituents are present in the waters near the shore as a result of drainage from the land. The proper study of the marine alga, then, must include the study of its food, or, the chemical composition of the sea water.

For these reasons the "seashore" constitutes the richest food-producing region in the entire sea, while much of the ocean bottom,—except where in the vicinity of the shores it is covered with a layer of detritus—must be regarded as a desert waste.

Sea animals, like those of the land, require organic food materials. They depend entirely upon plants or other animals for their food, ingesting protein or amino-acid from the living or dead organisms. The scavengers find their food in the organic matter in the bottom detritus; the gill-rakers live upon plankton forms; but very many animals obtain their food, wholly or in part, directly from the attached seaweeds.

In the case of plankton and detritus feeders indiscriminate feeding is the rule, but most fishes and even shellfish select their own particular kind of food from the available food supply and the method of obtaining it may be a highly specialized procedure.

The large surf-loving algae of the coast form "sea forests" which support a great variety of animals, some of which feed directly upon the algae themselves, some cling to them for shelter from surf, or sun, or enemies, and some find their prey among them. These natural feeding grounds of the shore attract many species of fish. Most food fishes, in fact, spend their time in searching for food in close proximity to the coast. Many fishes consume other forms of animal life, but, directly or indirectly the algal end of the food chain is ultimately reached. It is a fact that the great fishing grounds are never found very far from fields of algae.

It has long been a problem of thought and investigation as to how the animals of the sea are supported. Apparently those commonly seen are carnivores. It must be true, however, that in the sea as on the land, vegetarians greatly exceed in numbers and bulk the beasts of prey which feed upon them. As investigations are carried farther, results will show the correctness of this statement. The blue whale, the largest of all known animals, lives on masses of diatoms and the other minute plankton organisms. Six-foot specimens of squid, recently captured off Catalina Island, were found to have their stomachs full of seaweed. Many small reef fishes of Hawaii have been proved by the writer to subsist entirely upon attached seaweeds. It is idle to state that fixed plants are not used as food by marine animals simply because the great proportion of them "apparently live out their lives with only a comparatively trivial amount of interference from animals." Who can say that animals do not continually browse upon them? Land plants indeed are not usually visibly disturbed by animal enemies, yet it is well-known that land carnivora are few in number compared to the herbivorous animals.

It is safe to state that no animal is able to attain maturity unless its proper food is at hand. This statement contains in a nutshell the answer to the whole question. To paraphrase Mann's four-word sentence: "No food, no animal." Therefore, the proper study of the animal must include a study of its food.

Primitive people, either through necessity or instinct, sought the seashore as their natural food supply and maintained a close contact with its life. Much of the knowledge so gained has been forgotten with the progress of civilization and, until this problem has been given adequate scientific investigation, the possibilities of the utilization of marine products will remain unknown.

The study of the food of fishes must receive more and more attention. The importance of tracing food successions from the marine plants to the food fishes used by man must be realized. A knowledge of the structures and life processes of the algae is fundamental to any scientific investigation of their use, directly to man, or as food for fishes.

Moreover, not only do the marine algae constitute the primitive food supply of marine animals used as food by man, but the origin of Vitamin A in fish oil and fish liver oils has been traced back to the synthetic powers of these plants; and also it has been proved that these fish oils have extremely high iodine values, though not so high as the algae themselves.

The facts now are that malnutrition exists in 20-25 per cent. and varies in 60-70 per cent. among the ten million American children of pre-school age. (Science, 63:x. 1926).

In all seriousness the attention of the biochemist and medical physiologist is called to the fact that, if in time it might be made possible to manufacture baby-foods from ground seaweeds and appetizing salad dressing from cod liver oil—the taste being efficiently masked—many of the ills of mankind would completely disappear. Goiter, neuritis, scurvy, rickets, and tooth decay may be eradicated by such means.

In a word, then, the sea holds for civilized races the solution of most of the deficiency problems of the medical profession.

Sir John Murray believed the sea to be capable of a productivity equal to that of the land. Marine biology is a new field which may lead to the advent of a science of *mariculture* equal in promise to that of agriculture at the present day. Certain it is that we do not yet realize the richness and vastness of the treasure now hidden in the sea.

The present bibliography contains a list of papers relating to this subject. It is hoped that they may be helpful to those

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Scientific and Industrial Research in New Zealand

A new Department of Scientific and Industrial Research has been created in New Zealand with headquarters at Wellington. E. Marsden is secretary. Under date of May 25, 1926, there was issued Parliamentary Paper H-27, on the organization of the Department, from which we abstract the following introductory statement:

"It is generally recognized that feeling has increasingly grown during the last few years amongst progressive agriculturists and industrialists and others that the time has arrived for a better linking up of science with our national industries, primary and secondary. It has also been recognized by Government that need exists for a central authority to exercise control and to overlook the research work carried on by Government Departments; to suggest means for cooperation and coordination of the research work carried out by the University Colleges, other institutions and private workers; to prevent overlapping, and to advise Government in the subsidizing or endownment of research by grants, etc."

The Pan-Pacific Research Institution wishes the new Department of Scientific and Industrial Research a wide field of usefulness and offers its heartiest cooperation.

A Duodecimal System of Numbers

By J. S. Donaghho, Professor of Mathematics, University of Hawaii

In a duodecimal system of numbers, displacing a digit one place to the left or right will multiply or divide it by twelve. That is, 10, 0.1 and 100 will represent, respectively, twelve, one-twelfth, and twelve squared (one gross). As the decimal system requires ten symbols, so the duodecimal requires twelve, and the initial letters "T" and "E" will be used in this discussion for ten and eleven, respectively. Then 6T, E2, and E9T will represent, respectively, six twelves plus ten, eleven twelves plus two, and eleven gross plus nine twelves plus ten. Also, T58E will represent ten times twelve cubed, plus five gross, plus eight twelves, plus eleven. A simple computation shows that, in decimal notation, this amounts to 18,107.

With this notation we form the following multiplication table:

1	2	3	4	5	6	7	8	9	T	E	10	11	12
2	4	6	8	T	10	12	14	16	18	1T	20	22	24
3	6	9	10	13	16	19	20	23	26	29	30	33	36
4	8	10	14	18	20	24	28	30	34	38	40	44	48
5	T	13	18	21	26	2E	34	39	42	47	50	55	5T
6	10	16	20	26	30	36	40	46	50	56	60	66	70
7	12	19	24	2E	36	41	48	53	5T	65	70	77	82
8	14	20	28	34	40	48	54	60	68	74	80	88	94
9	16	23	30	39	46	53	60	69	76	83	90	99	T6
T	18	26	34	42	50	5T	68	76	84	92	T0	TT	E8
E	1T	29	38	47	56	65	74	83	92	T1	E0	EE	10T
10	20	30	40	50	60	70	80	90	T0	E0	100	110	120

The 5 and 7 columns of this table would be the most difficult ones to memorize, but each of them would be as easy as the 7 column of the decimal table; 2 and 6 of the duodecimal system would be just as easy as 2 and 5 of the decimal; T and E of the duodecimal just as easy as 8 and 9 of the decimal; 3, 4, 8 and 9 of the duodecimal much easier than the same columns of the decimal; while the last two columns of this table are just as easy as the 11 and 12 columns of the decimal table, and they represent 13 and 14 of the decimal numbers, which are so difficult that we do not learn them.

With a little practice, computation in the duodecimal system becomes just as easy as in the decimal, and the writer has computed several of the constants of mathematics in the system: e. g., the square roots of 2 and 3, the values of *pi* and *e*, eleven logarithms to the base *e*, and ten logarithms to the base twelve.

A glance at the foregoing table will show that mere inspection of the last digit of a duodecimal number will show whether it is divisible by 2, 3, 4, 6 and 12. Also, inspection of the last two digits will determine whether it is divisible by 8 or 9, and it will be divisible by eleven if the sum of the digits is divisible by eleven. This is much more than we can learn so simply from a decimal number.

As a few other advantages of the duodecimal over the decimal system, we may note:

(1) A duodecimal integer of two or more digits expresses a larger number than a decimal integer of the same number of digits.

(2) An irrational duodemical fraction of three or more places gives a closer approximation to the correct value than a decimal fraction of the same number of places.

(3) A larger number of frequently used fractions, as 1/2, 1/3, 1/4, 1/6, 1/8, 1/9, etc., can be expressed exactly as duodecimals.

(4) The computation of interest would be very simple, for periods of months, or for periods of days that are multiples of 2, or of 3.

The Botanical Garden of the Pan-Pacific Research Institution in Honolulu to Stimulate Botanical Research Among the Pan-Pacific Nations

By Dr. J. C. Th. Uphof, Rollins College, Winter Park, Florida

There are many reasons why the erection of a Botanical Research Institution in a central location among the great countries of the Pacific should be stimulated. Sciences are international, and the cooperation among scientists of the different nations has always been most friendly and cordial. Especially among the countries of that great association, the Pan-Pacific Union, a well organized research institution in plant sciences will be of incalculable benefit to all concerned. In the first place, it will advance our knowledge to the benefit of science, industry and agriculture, and last, but not least, the "Scientia amabilis," as botany as been often called, will tie these nations together on the friendly footing of cooperation and mutual understanding.

It is quite apparent that it is of paramount importance to the continents and islands bordered by the Pacific Ocean for there is so much that has to be mutually investigated in all these diversified and highly cultured countries with their glorious traditions and there is so much that has to be arranged that there is no doubt that the Pan-Pacific Research Institution will be able to work out successfully the greatest problems involved.

There is no doubt that the study of the natural resources is very necessary, indeed. One of the most important and outstanding activities which has to be accomplished is that of the study of plant products. The various nations forming the Pan-Pacific Union are most diversified as to customs and modes of living. In the first place their food products and methods of how to obtain and how to prepare them have developed themselves during ages past along such different lines that it will be most promising to make these methods better known and advance them along the road of scientific progress.

There is no doubt that for such great work, headquarters have to be established where much of the investigational activities will be conducted. For such a purpose the beautiful and splendid Hawaiian Islands especially the vicinity of Honolulu are fitted for this purpose. Research needs highly trained scientists; it needs to be stimulated and men engaged in such work should never be thwarted by political intentions. Like everywhere in Europe and in Asia, their position should be permanent. For this reason the Old World has been able to obtain such gigantic results in the field of research. Every day new problems are being worked out in the laboratory for the benefit of mankind and to the advancement of industry. The backwardness of many of our manufacturers in not stimulating and financing industrial research on a scientific basis has caused already much alarm. It is of great importance as to how we shall conduct in the future fundamental research in that part of the world. The field of the manufacturing of plant products is unlimited. Many crops, especially those of the countries bordering the Pacific need to be improved by highly experienced specialists. Such men have to be acquainted with plant breeding and the laws of variability, heredity and hybridism. We need the cooperation of

organic and bio-chemists and bio-physicits who are able to discover the properties and a better use of many plants that need our attention and from which agriculture and industry may expect large profits. Waste products are often neglected from which important materials may be manufactured.

A well organized plan on a technical and scientific basis will ensure the success of this test. Three essentials are necessary, namely, a botanical garden, a botanical laboratory and an extensive museum with a herbarium. From a purely educational standpoint the botanical garden may be grouped in a (1) systematical, (2) plant geographical and (3) economic collection. Each one has its advantages, though a large botanical garden should possess all of these groups. Moreover, special collections should be found like an arboretum, a collection of annual and perennial plants and the like.

Under a systematical plant collection, we understand groups of plants arranged into various plant families according to their probable relationship. A plant geographical collection contains plants that are grouped as to the distribution of plants over the world. One of the finest and most up-to-date collections of this kind is to be found in the Botanical Garden of the University of Berlin in Steglitz-Dahlem where the principal plant associations of almost every country, not excepting those along the Pacific coasts are represented. Under an economical collection is understood groups of plants that are being used in industry, in medicine, by native peoples and in fact all species that are in any way beneficial to mankind and domestic animals. Such a collection should become very complete and could become very attractive in a modern botanical garden of the Pan-Pacific Union. It will be of unusual interest for purely educational purposes as well, where the student is able to find without any difficulty all the useful plants of a certain region.

Under an arboretum is understood a collection of trees and shrubs that are usually grouped in systematical order. The value of an arboretum is manifold. It aids us in scientific forestry, in economic botany and when well kept, it instructs us as to its value from an ornamental standpoint. There is no doubt that an extensive arboretum in the Botanical Garden at Honolulu would be of unusual value. There are some extensive arboretums in colder climates like in the Royal Botanical Gardens at Kew; those in the tropics are less prevalent, except in the beautiful botanical garden in Buitenzorg, Java and a few other places. Moreover the upkeep of an arboretum is not as expensive as growing some other groups of plants. When trees and shrubs are once established they do not require extra care, except some yearly pruning and fertilizing. Even the latter will be considerably diminished when a good type of soil is chosen.

For some reason or other, some plants cannot be cultivated, or can not be obtained in a living condition. For this purpose a well kept herbarium, or dried collection of plants, will be a very considerable asset, which will never fail in a botanical institution.

The botanical museum has to contain a complete collection of all rough materials as well as finished plant products, thus enabling the student or the visitor to give a general idea of what can be manufactured. It should not be very difficult to obtain within a few years a complete collection of this kind. There is no doubt that a modern up-to-date institution for plant research, as one of the central organizations among the Pan-Pacific countries, will place the mutual understanding among the nations on a higher level to the benefit of all.

Overseas Delegates to the Third Pan-Pacific Science Congress, Japan, 1926

UNITED STATES OF AMERICA

Atwood, President Wallace W., B. S., Ph. D., Clark University, Worcester, Massachusetts; representing Clark School of Geography and Clark University.—**Geography.**

Austin, Dr. Louis W., D. Sc., Ph. D., Director Laboratory for Special Radio Transmission Research, United States Bureau of Standards, Washington, D. C.; representing American Section of the International Union of Scientific Radiotelegraphy, and United States Bureau of Standards.—**Wireless Telegraphy.**

Bartlett, Professor Harley H., A. B., University of Michigan, Ann Arbor; representing University of Michigan.—**Botany.**

Courts, Commander George M., American Embassy, Tokyo; representing United States Navy Department.

Cressey, Professor George B., M. A., Ph. D., Shanghai College, Shanghai, China; representing Shanghai College.—**Geology.**

Day, Dr. Arthur Louis, A. B., Ph. D., Hon. Sc., Director Geophysical Laboratory of Carnegie Institution, Washington, D. C.; representing Carnegie Corporation of New York, Carnegie Institution of Washington, D. C., and American Geophysical Union.—**Geophysics.**

Fenneman, Professor Nevin M., A. B., A. M., Ph. D., University of Cincinnati, Cincinnati, Ohio; representing University of Cincinnati, Association of American Geographers, American Geographic Society, United States Geological Survey, and National Research Council.—**Geology.**

Furness, Dr. Caroline E., A. B., Ph. D., Vasser College, New York; representing Vasser College.—**Astronomy.**

Gee, Mr. N. Gist, Assistant Resident Director, China Medical Board of Rockefeller Foundations, Peking, China; representing the Peking Society of Natural History and China Medical Board of Rockefeller Foundations.—**Biology.**

Harris, President F. S., B. S., Ph. D., Brigham Young University, Provo, Utah; representing Brigham Young University.—**Agricultural Chemistry.**

Heck, Commander N. H., A. B., C. E., United States Coast and Geodetic Survey, Washington, D. C.; representing American Geophysical Union and National Research Council.—**Geodesy.**

Holland, Mr. Maurice, Director, Division of Engineering and Industrial Research, National Research Council; representing United States Government and National Research Council.—**Engineering.**

Isobe, Dr. Fusanobu, Suzuki and Co., Kobe, Japan; representing Indiana University.

Itaano, Dr. Arao, D. Ag., Ohara Agricultural Research Institute, Ohara. — **Agricultural Chemistry.**

Jenkins, Miss Louise F., A. M., Hinomoto Jo-gakko, Himeji, Japan; representing Mount Holyoke College.—**Astronomy.**

Kashima, Mr. Kozo, Military Scientific Laboratory, War Department, Tokyo, Japan; representing American Chemical Society.—**Chemistry.**

Kozu, Professor Shukusuke, D. S., Tohoku Imperial University Sendai, Japan; representing Mineralogical Society of America.—**Mineralogy Petrography.**

Littlehales, Professor G. W., George Washington University, Hydrographer, Hydrographic Office, United States Navy Department; representing United States Government, United States Navy Department, American Geophysical Union, and National Research Council.—**Hydrography.**

Lowdermilk, Professor W. C., University of Nanking, China; representing Society of American Forestry.—**Forestry.**

McEwen, Professor George F., A. B., Ph. D., Scripps Institution of Oceanography of the University of California, La Jolla, California; representing University of California, and American Geophysical Union.—**Oceanography.**

Martel, Professor R. R., S. B., California Institute of Technology, Passadena, California; representing Southern California Council on Earthquake Protection.—**Seismology.**

Mendenhall, Mr. W. C., B. S., Chief Geologist, United States Geological Survey, Washington, D. C.; representing United States Geological Survey, and National Research Council.—**Geology.**

Myers, Professor Clyde H., Ph. D., New York State College of Agriculture, Cornell University, Ithaca; Ithaca, New York; representing American Genetic Association.—**Plant Breeding.**

Noble, Dr. Levi F., A. M., Ph. D., Geologist, United States Geological Survey; representing United States Geological Survey.—**Geology.**

Parker, Professor George H., B. S., Sc. D., Harvard University, Cambridge, Massachu-

setts; representing Harvard University, Marine Biological Laboratory, Woods Hole, Massachusetts, American Society of Zoologists, and American Society of Naturalists.—**Zoology.**

Porter, Professor R. Howard, B. S., University of Nanking, China; representing American Phytopathological Society.—**Plant Pathology.**

Reid, Professor Harry Fielding, C. E., A. B., Ph. D., Johns Hopkins University, Baltimore, Maryland; representing Johns Hopkins University, American Geophysical Union, and Geological Society of America. —**Dynamic Geology.**

Setchell, Professor W. A., A. B., A. M., Ph. D., University of California, Berkeley, California; repesenting Botanical Society of America and University of California.—**Botany.**

Starr, Dr. Frederick, B. S., M. S., Ph. D., Hon. Sc. D., Emeritus Professor, University of Chicago; representing University of Chicago.—**Anthropology.**

Swingle, Dr. Walter T., B. S., Ph. D., Hon. D. Sc., Senior Physiologist, Bureau of Plant Industry, United States Department of Agriculture; representing United States Department of Agriculture and National Research Council.—**Botany.**

Tashiro, Professor Shirosuke, S. R., Ph. D., University of Chincinnati, Ohio; representing University of Cincinnati.—**Biochemistry.**

Tilden, Professor Josephiue E., B. S., M. S., University of Minnesota, Mineapolis, Minnesota; representing University of Minnesota.—**Botany**

Trewartha, Professor Glean T., A. B., A. M., Ph. D., University of Wisconsin, Madison, Wisconsin.—**Geography, Climatology.**

Vaughan, Dr. T. Wayland, B. S., A. M., Ph., D., Director, Scripps Institution of Oceanography of the University of California, La Jolla, California; representing United States Government, National Research Council, University of California, Paleontological Society of America, Ecological Society of America, United States National Academy of Sciences, American Geophysical Union, Carnegie Institution of Washington, D. C., Smithonian Institution and National Museum, and Geological Society of America.—**Geology, Oceanography.**

Vaughan, Dr. Victor C., B. S., M. S., Ph. D., LL. D., D. Sc., Chairman, Division of Medical Sciences of the National Research Council; representing National Research Council and American Medical Association. —**Physiological Chemistry.**

Watanabe, Professor Manjiro, D. Sc., Tohoku Imperial University, Sendai, Japan; representing Mineralogical Society of America. —**Mineralogy.**

Wilbur, President Ray Lyman, A. B., M. D., Hon. LL. D.; Leland Junior Stanford University; representing Leland Junior Stanford University.—**Physiology.**

Willis, Dr. Bailey, M. E., Ph. D., Emeritus Professor, Leland Junior Stanford University; representing Seimsmological Society of America, American Geophysical Union, and California Academy of Sciences.—**Geology, Seismology.**

AUSTRALIA

Andrews, Mr. E. C., B. A., F. G. A., Government Geologist of New South Wales, Mines Department, Sydney; Hon. Secretary, Australasian President, Association for the Advancement of Science; Vice-President, Royal Society of New South Wales; representing Government of the Commonwealth of Australia and Australian National Research Council.—**Geology.**

Boelke, Dr. Grace F., M. B., Ch. M., representing Town Planning Association of New South Wales.—**Medicine, Surgery.**

Cambage, Mr. R. H., C. B. F., F. L. S. (New South Wales), President, Australian National Research Council; representing Government of the Commonwealth of Australia and Australian National Research Council.—**Botany.**

Cotton, Professor Leo A., M. A.; D.Sc., University of Sydney; representing Australian National Research Council.—**Geology.**

Halligan, Mr. G. H., F. G. S.; Turramurra, Sydney; representing Australian National Research Council.—**Hydrography.**

Haney, Dr. Jean White, D. Sc., Lyceum Club, Albert Street Brisbane; representing Australian National Research Council.—**Botany.**

Nicholls, Professor G. E., D. Sc., A. R. C. Sc., F. L. S., University of Western Australia, Perth.—**Zoology.**

Osborn, Professor T. G. E., D. Sc., University of Adelaide, representing Australian National Research Council.—**Botany.**

Pigot, Rev. Edward F., S. J., B. A., B. Ch., Director, Seismological Observatory, St. Ignalius College, Riverview, Sydney; representing Government of the Commonwealth of Australia and Australian National Research Council.—**Seismology.**

Richardson, Dr. A. E. V., M. A., D. Sc., Director, Waite Agricultural Research Institute, University of Adelaide; representing Australian National Research Council.—**Agriculture.**

Sweet, Professor Georgina, D, Sc., University of Melbourne; representing Australian National Research Council.—**Parasitology.**

Taylor, Professor Griffith, B. A., B. E., D. Sc., F. G. S., F. R. G. S., University of Sydney; representing Australian National Research Council.—**Geography.**

Vonwiller, Professor O. U., B. Sc., University of Sydney; representing Australian National Research Council.—**Physics.**

Woodruff, Professor H. A., M. R. C. V. S., M. R. C. S., L. R. C. P., University of Melbourne; representing Australian National Research Council.—**Veterinary Science.**

CANADA

Adams, Dr. Frank Dawson, Ph. D., Sc., LL. D., F. R. S., Hon. M. E. I. C., Hon. M. I. M. M., Hon. M. A. I. M. M. E., Emeritus Vice–Principal, McGill University, Montreal; representing Royal Society of Canada, Canadian National Research Council and McGill University.—**Geology.**

Brock, Professor R. W., M. A., LL. D., F. G. S., F. R. S. C., Dean, Faculty of Applied Science, University of British Columbia; representing University of British Columbia Federal Department of Mines, and Canadian National Research Council.—**Geology.**

Fraser, Professor C. MacLean B. A., M. A., Ph. D., F. R. S. C., University of British Columbia; representing University of British Columbia and Canadian National Research Council and Biological Board of Canada.—**Geology.**

Tory, Dr. Henry Marshall, M. A., D. Sc., LL. D., F. R. S. C., F. R. H. S., Principal, University of Alberta, Edmonton; Hon. President, Canadian National Research Council; representing Government of Canada, Royal Society of Canada, and Canadian National Research Council.—**Mathematics, Physics.**

CHILE

Rose-Innes, Mr. Arthur, Chilian Legation, Tokyo; representing Chilean Government.

CHINA

Barbour, Professor George B., M. A., Yenching University. Peking, China; representing Yenching University.—**Geology.**

Chen, Professor Huan-Yung, D., Sc. South-Eastern University, Nanking; representing the Science Society of China.—**Botany.**

Ch'in, Professor Fen, Peking National University, Councillor, Ministry of Education, Peking; representing the Government of China.—**Mathematics, Astronomy.**

Chu, Mr. Coching C., Secretary, Science Society of China; representing the Science Society of China; Chief Editor of Geography and History Division, Commercial Press, Shanghai.—**Geodesy.**

Dunlap, Dr. A. M., Ph. D., Dean, Peking Union Medical College, Peking, China; representing the Peking Union Medical College.—**Medical Science.**

Grant, Professor John B., Ph. D., Peking Union Medical College, Peking, China; representing the Peking Union Medical College.—**Hygiene.**

Hoffmann, Professor William Edwin, Canton Christian College, Canton, China.—**Biology.**

Hsueh, Professor Te-yu, National Wuchang University; representing Chinese Society of Science and Arts.—**Zoology.**

Hu, Mr. Tun-fu, Principal, National Women's College.

Hu, Professor Pu-tseng, South-Eastern University.

Li, Mr. Chia-fu, Principal, School, of Military Surgeon, Chekiang; representing the State Government of Chekiang.—**Medical Science.**

Li, Professor Hsi-mou, Southern University. —**Physics.**

Lee, Professor J. S., National Peking University, Peking; Vice-Director, Peking Metropolitan Library.—**Geology.**

Shen, Professor Tsung Hunt, Nanking University; Nanking; representing Chinese Agricultural Society and Science Society of China.—**Agriculture.**

Tan, Professor Hsi Hung, Peking University, Peking; representing the Chinese Society of Science and Arts.—**Botany.**

Wai Professor Nganshou, Kwang Hua University, Daishi Road, Shanghai; Director, Nganhai Chemical Laboratory; representing the Chinese Society of Science and Arts.—**Agriculture.**

Wang, Dr. I-rin, D. M., Tsing Tau Hospital. —**Medical Science.**

Wong, Mr. Wenhao, Director, Geological Survey of China, Peking; representing the Geological Survey of China.—**Geology.**

Zen, Mr. H. C., Excutive Secretary, China, Foundation for the Promotion of Education and Culture; representing the Science Society of China.

FRANCE

Lacroix, Professor Alfred, Museum of Natural History; Permanent Secretary, Academy of Science; representing French Government.—**Geology.**

Ruellan, Professor Francis, l'Ecole Navale Francaise; representing Comite national de Geographic de France.—**Geography.**

GREAT BRITAIN

Batchellor, Mr. John, Sapporo, Hokkaido. —**Ethnology.**

Lenox-Conyngham, Colonel Sir Gerald P. M. A., F., R. R., R. E., Reoder, Trinity College, Cambridge; representing British Government and Royal Society of London.— —**Geodesy.**

Praudman Dr. J., M. A., D. Sc., F. R. S., Director, Liverpool Tidal Institute; representing Hydrographical Committee of the Royal Society of London.—**Oceanography.**

HAWAII

Cooke, Dr. C. Montague, A. B., Ph. D., Curator, Bernice Pauahi Bishop Museum, Honolulu; representing the Bernice Pauahi Bishop Museum.—**Zoology.**

Fullaway, Mr. David T., A. B., A. M., Government Entomologist, Hawaiian Board of Agriculture and Forestry; representing Hawaiian Board of Agriculture and Forestry. —**Entomology.**

Gregory, Professor Herbert E., A. B., Ph. D., Yale University; Director, Bernice Pauahi Bishop Museum; representing the United States Government, Yale University, United States National Research Council, Bernice Pauahi Bishop Museum, and Geological Society of America.—**Geology.**

Handy, Dr. Edward Smith, A. B., A. M., Ph. D., Curator, Bernice Pauahi Bishop Museum, Honolulu; Lecturer, University of Hawaii; representing Bernice Pauahi Bishop Museum.—**Ethnology.**

Handy, Dr. Willowdean Chatterson, Ph. D. Associate in Polynesian Folkways, Bernice Pauahi Bishop Museum, Honolulu; representing Bernice Pauhi Bishop Museum.— **Ethnology.**

Jaggar, Dr., T. A., Ph. D., Director, Kilauea Volcano Observatory, Honolulu; representing United States Geological Survey, American Geophysical Union, and Hawaiian Volcano Research Association.—**Volcanology, Seismology.**

Jones, Miss Stella M., Editor, Bernice Pauahi Bishop Museum; representing Bernice Pauahi Bishop Museum.

Krauss, Professor Frederick G., University of Hawaii; representing University of Hawaii.—**Agriculture.**

HONGKONG

Brock, Professor R. W., M. A., LL. D., F. R. S. C., Dean, Faculty of Applied Science, University of British Columbia; representing the Government of Hongkong.— **Geology.**

NETHERLANDS

Brouwer, Professor H. A., D. Sc., Technical University, Delft; representing Royal Academy of Sciences in Amsterdam.— **Geology.**

Romburgh, Professor P. van, D. Sc., University of Utrecht; representing the Royal Academy of Sciences in Amsterdam.— **Chemistry, Agriculture.**

Went, Professor F. A. F. C., D. Sc., University of Utrecht; President of the Section of Sciences, Royal Academy of Sciences in Amsterdam; representing Royal Academy of Sciences in Amsterdam.— **Botany.**

NETHERLANDS EAST INDIES

Bijlmer, Dr. H. J. T. M. D., Military Surgeon, Batavia; representing the Government of Netherlands East India and the Netherlands Indian Bureau of Anthropology.— **Anthropology.**

Boerema, Dr. J., D. Sc., Director, Meteorological Observatory, Batavia; representing the Government of Netherlands East Indies.—**Geophysics.**

Clay, Professor, J., D. Sc., Technical University and the Royal Society of the Netherlands East Indies.—**Physics.**

Dammerman, Dr. K. W., D. S., Zoological Museum and Laboratory, Buitenzorg; representing the Government of Netherlands East Indies and the Netherlands Indian Society for the Protection of Nature.—**Zoology.**

Gisolf, Dr. W. F., D. Sc., Department of Mines, Bandoeng; representing the Government of Netherlands East Indies.— **Mineralogy.**

Rutgers, Dr. A. A. L., D. S., Director, Department of Agriculture, Industry, and Commerce, Buitezorg; representing the Government of Netherlands East Indies. —**Botany.**

Schrieke, Professor B. T. O., College of Law, Batavia; representing Batavia Society of Arts and Sciences, the Gocvernment of Netherlands East Indies, the Netherland Indian Committee for Secentifie Resarehes. —**Sociology.**

Stehn, Ch. E., D. Sc., Acting Chief, Volcanological Survey, Bandoeng; Department of Menes, Bandoeng; representing the Government of Nethlands East Indies.— **Volcanology.**

NEW ZEALAND

Benson, Professor W. N., B. A., D. Sc., F. G. S., F. G. S. A., F. R. G. S., University of Otago; representing the University of Otago and Otago Institute.—**Geology.**

Brown, Dr. J. Macmillan, M. A., LL. D., Chancellor, University of New Zealand; representing the University of New Zealand.—**Anthropology.**

Farr, Professor C. Coleridge, D. Sc., F. P. S. L., F. N. Z. Inst., University of the New Zealand Institute; representing New Zealand Institute.—**Geophysics.**

Marshall, Dr. P., M. A., D. Sc., F. G. S., F. R. Z. Inst., Honorary Secretary, New Zealand Institute; representing the New Zealand Institute.—**Geology, Geography.**

PAPUA

Murray, Sir Hubert, K. C. M. G., Lieutenant-Governor, Chief Judical Officer, Government of Papua; representing the Government of the Commonwealth of Australia. —**Anthropology.**

PERU

Bonnemaison, Mr. Don Manuel, Peruvian Minister; representing Government of Peru.

PHILIPPINE ISLANDS

Alivir, Mr. Antonio D., E. M., M. S., Geologist, Bureau of Science, Manila; representing Philippine Scientific Society.—**Geology.**

Brown, Dr. William Henry, B. S., Ph. D., Director, Bureau of Science, Manila; representing the Government of Philippine Islands.—**Botany.**

Elicano, Mr. Victoriano, B. S., Assistant Director, Bureau of Science, Manila; representing Government of Philippine Islands and Philippine Scientific Society.—**Geology**

Feliciano, Professor Jose H., Phar. G, A. B., Phar. B. S., M. S., Phar, D., Ph. D., University of Philippines; representing Government of Philippine Islands and Philippine Scientific Society.—**Geology.**

Gonzalez, Professor Bienvendo M., M. S., D. Sc., University of Philippines; Consulting Animal Breeder, Bureau of Non-Christian Tribes; representing the Government of Philippine Islands, University of Philippines, and Philippine Scientific Society.—**Animal Husbandry.**

Herre, Dr. Albert William Christian Theodore, A. B., A, M., Ph. D., Chief, Government of Philippine Islands.—**Zoology.**

Lara, Professor Hilario, M. D., C. P. H., Dr. P. H., University of Philippines; representing Government of Philippine Islands, Philippines Scientific Society, and University of Philippines.—**Hygiene.**

Ruauo, Rev. Roque, M. Sc., Professor, University of Santo Tomas; representing University of Santo Tomas.—**Geology, Seismology.**

Selga, Rev. Miguel, S. J., A. B., Ph. D., Director, Philippine Weather Bureau, Manila; representing Government of Philippine Islands.—**Astronomy, Meteorology.**

PORTUGAL

Costa, Dr. Fernandes, Macao, representing the Government of Portugal.

STRAIT SETTLEMENTS AND FEDERATED MALAY STATES

Jack, Dr. H. W., D. Sc., F. M. S., Economic Botanist, Government of the Federated Malay States; representing the Government of the Strait Setlements and Federated Malay States.—**Economic Botany.**

Kloss, Mr. Boden C., Director, Museum of the Strait Settlements and Federated Malay States; Director, Raffles Library of the Strait Settlements.

Wilbourn, Mr. E. S., Assistant Geologist, Government of the Federated Malay States; representing the Geological Department of the Federated Malay States. —**Geology.**

U. S. S. R.

Ahnert, Mr. Edward, Harbin, China; representing Geological Committee of the Russian Far East and Manchuria Research Society.—**Geology.**

Berg, Professor Leo S., D. Sc., Leningrad University; Chief of the Bureau of Applied Ichthyology; representing U. S. S. R. Academy of Science, Geography.—**Biology.**

Komaroff, Dr. V. L., D. Sc., Fellow, U. S. S. R. Academy of Science; Vice President, Russian Geographical Society; representing U. S. S. R. Academy of Science.—**Botany.**

Nikiforoff, Professor P. M., D. Sc., Institute of Physico-Mathematics, U. S. S. R. Academy of Science; representing U. S. S. R. Academy of Science.—**Physics, Seismology.**

Schmidt, Professor Peter, D. Sc., Leningrad University, Institute of Agronomy; Curator, Zoological Museum of the U. S. S. R. Academy of Science, representing U. S. S. R. Academy of Science.—**Biology.**

Sternberg, Professor L. J., Leningrad University; Curator, U. S. S. R. Academy of Science.—**Ethnology, Anthropology.**

Tchepourkovsky, Professor Ethyme, D. Sc., Vladivostok University; Faculty of Law, Harbin; representing the Geological Committee of Russian Far East.—**Geography, Anthropology.**

Dr. Sibiriakov-Vilensky, D. Sc., President, Society of Study of Siberia, Ural and Far East.

SWEDEN

Skottsberg, Professor Carl, Director, Botanic Garden, Gothenburg.—**Botany.**